March 13, 1856.

Sir BENJAMIN C. BRODIE, Bart., V.P., in the Chair.

The following communications were read:—

I. "On the presence of fibrils of soft tissue in the Dentinal Tubes." By JOHN TOMES, Esq., F.R.S. Received February 21, 1856.

(Abstract.)

Referring to the structural characters of dentine, and to the prevailing belief that the dentinal tubes in the normal condition contain fluid, the author goes on to show that the recognized histological characters fail to account for the high degree of sensibility exhibited by the dentine when diseased, or when suddenly exposed by the removal of the enamel.

It is found, moreover, that the dentine is not uniformly sensitive throughout, but possesses a much higher degree of sensibility at the peripheral distribution of the dentinal tubes than deeper in the substance of the tooth; and it is urged that these facts cannot be accounted for by the presence of a fluid in the dentinal tubes, nor by supposing that the hard unyielding dentine is intrinsically endowed with sensation. This view of the matter is borne out by the fact, that all sensibility is at once lost if the pulp of the tooth be destroyed.

Finding that the dentine owed its sensibility to the presence of the dentinal pulp, and knowing that the tubes have open extremities in contact with the pulp, the author was induced to examine carefully the contents of the tubes. The investigation resulted in discovering that the dentinal tubes, instead of containing fluid only, give passage to fibrils of soft tissue, which pass from the pulp into the tubes where these open upon the surface of the pulp-cavity, and from thence may be traced into the branches. The fibrils may be demonstrated by fracturing a perfectly fresh tooth, and then with a sharp knife taking very thin sections from the dentine near the edge of

the pulp-cavity. The dentine will, when cut, break up into small fragments, and from the edges of these the fibrils may be seen extending. Sometimes a small portion of the pulp will be found adherent, in which case the fibrils may be seen to extend from that tissue into the dentine. The fibrils may be shown in a more striking manner by decalcifying a section, and then, when it is placed upon a slide, tearing the specimen across the direction of the tubes. By this manipulation, the fibrils will be dragged out from one fragment, and will be seen projecting from the edge of the other.

The fibrils, when isolated and examined with a high power, without the presence of a reagent, show some indications of tubularity, but not with sufficient distinctness to enable the author to determine whether they are tubes or solid bodies. Their appearance is very like that of the ultimate fibrils of spinal nerves, and they possess a character in common with these, in the presence of minute globules of dense transparent matter exuded from the broken ends, and sometimes from the surface of the fibril. It is not easy to determine in what manner the fibrils commence in the pulp. In some preparations they appear to be connected with cells situated a short distance within the pulp, in others they may be traced to a greater depth, where they are lost in the tissue of the pulp, and may possibly be connected with the nerves, which in this part are very abundant. But in the absence of exact knowledge as to the manner in which the dentinal fibrils are related to the elements of the pulp, the author considers that there is sufficient evidence to warrant the conclusion that they are organs of sensation, the distribution of which through the substance of the dentine endows that tissue with its sensibility.

This conclusion is borne out by the occurrence of the following conditions. If a fragment of enamel be broken from the surface of the dentine, the exposed portion of the latter tissue is highly sensitive to the contact of foreign bodies; but if the force producing the injury be sufficient to rupture the nerves and vessels where they enter the root of the tooth, the dentine loses its capability of feeling pain. Again, if the dentine be exposed by the gradual wearing away of the enamel by mastication, the surface evinces no sensibility, a circumstance accounted for by the fact that the dentinal tubes have become consolidated, either at the surface exposed, or at some point between the surface and the pulp-cavity. Diseased teeth furnish

further evidence in favour of the foregoing views. If a carious tooth, in which the disease has advanced but slowly, and the carious portion is dark in colour and tolerably firm in consistence, be examined, it will be found that the dentinal fibrils have become calcified, and in a favourable section they may be seen projecting from the edge of the specimen, or lying broken in short lengths in the tubes. On removing the diseased part of the tooth in such a case, no pain is experienced until the instrument reaches the healthy dentine. Supposing, however, the disease to have been rapid in its progress, the carious tissue will be light in colour, and, as compared with the preceding example, soft in consistence. The removal of the affected part in this case is frequently attended with considerable pain. Examination will then show that the dentinal fibrils have not been consolidated, but may be found here and there extending into the softened tissue without having suffered any appreciable alteration of appearance.

Daily experience shows that a tooth may remain useful for a long time after the pulp, and consequently the dentinal fibrils, have been destroyed. If, however, a tooth which has been so circumstanced be examined, it will be found that one of two actions has been set up. Either additional cementum will have been developed upon the surface of the fang, or its bulk will have become diminished by absorption. Similar conditions supervene when the crown of a tooth has been lost by caries.

In old persons we find the teeth are lost without apparent disease in the dental tissues. The teeth become loose and fall out, the roots being in such cases translucent like horn. This condition is the result of consolidation of the dentinal fibrils, and is followed by absorption of the cementum and dentine. Cases may be found in which the whole of the fang has been absorbed, but reduction to two-thirds or half of the normal bulk is very common.

The concurrence of the foregoing changes in the sensibility of the tooth, with the destruction or consolidation of the dentinal fibrils, will, the author considers, justify the conclusion, that the dentinal fibrils, in a state of integrity, are necessary to the normal condition of dentine.